AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), TURKEY

Document Prepared By Gte Karbon Sürdürülebilir Enerji Eğt. Dan. Ve Tic. A.Ş.

Project title	AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), TURKEY
Project ID	1174
Monitoring period	14-August-2019 to 31-December-2023
Original date of issue	25-June-2024
Most recent date of issue	24-July-2024
Version	03
VCS Standard Version	ACM0002-Version.20.0
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Akcay Hes Elektrik Üretim A.Ş. installed Akçay HEPP with 28.78 MW runoffriver hydropower electricity plant (HEPP) at the end point of Bozdoğan – Akçay Left Coast Main Irrigation Channel in Aydin, Turkey. The expected life time of the project is minimum 40 years which corresponds to the duration of the licence obtained from EMRA. Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources which otherwise would have been generated by the fossil fuel fired power plant. According to domestic regulations, with an installed capacity of 28.78 MW the Akcay HEPP is qualified as a large-scale project. The project comes under Type I – Renewable Energy Project as per Appendix B of the procedures for CDM project activities. The project is a 28.78 MW HEPP and it uses renewable sources to produce electricity. There are three units in the plant and the total installed capacity of this hydroelectricity plant is 28.78 MWe/31.98 MWm according to the generation license provided by EMRA with a license number of EÜ/249-2/384 on 24/11/2003. The expected annual electricity generation is 76,170 MWh according to the registered PD dated 25/10/2021, and the expected emission reduction is 35,091 tCO_2e per year. The actual electricity generation is 139,355 MWh, and the actual emission reduction is 64,201 tCO_2e for the first monitoring period, which is between 14/08/2019 and 31/12/2023.

According to the methodology[1], baseline scenario was identified as “the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources”.

The milestones of the project activity are given in the table below.

Milestone	Date
The Electricity Production License is granted	24/11/2003
EIA Exemptions certification issued	17/09/2012
System Usage Agreement	23/03/2021
Connection Agreement	22/04/2020
Connection Agreement (revised)	08/05/2020
Provisional Acceptance	14/08/2009

[1] https://cdm.unfccc.int/UserManagement/FileStorage/AG07ZJQ3EXD42LT5YV9HR16M8KINPO

Milestone	Date
Electricity Generation	15/07/2009
Project Start Date	14/08/2009
First Crediting Period	14/08/2009 – 13/08/2019
First Monitoring Period of the First CP	14/08/2009 – 30/04/2013
Second Monitoring Period of the First CP	01/05/2013 – 13/08/2019
Second Crediting Period	14/08/2019 – 13/08/2029
First Monitoring Period of the Second CP (current)	14/08/2019 – 31/12/2023

The technical properties of the Akçay HEPP is given in the table below.

Location	AKCAY CREEK, WITHIN THE BOUNDARIES OF AYDIN PROVINCE
Total Installed Capacity	28.78 MW
Number Of Units	3
Turbine Capacity	11.60 MW (one) / 5.58 MW (two)
Turbine Type	Francis Type – Vertical
Turbine Make	Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China.
Length Of Penstock	380.00 M
Average Annual Power Generation	76.170 GWh

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	14-August-2009 – 13-August-2019 (1st crediting period)	VCS	Bureau Veritas Certification Holding SAS	Ten years

Verification	14-August-2009 – 13-August-2013 (1st monitoring period)	VCS	Rina Services S.P.A.	4 Years
Verification	14-August-2013 – 13-August-2019 (2nd monitoring period)	VCS	Re-carbon Ltd.	6 years
Validation	14-August-2019 – 13-August-2029 (2nd crediting period)	VCS	Re-carbon Ltd.	10 years
Verification	14-August-2019 – 31-December-2023 (1st monitoring period)	VCS	Rina Services S.P.A.	4 Years
	-	-	-	-

1.3 Sectoral Scope and Project Type

Sectoral scope[2]	1 "Energy Industry – Renewable/ Non-renewable Sources
Project activity type	ACM0002-Version.20.0: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Sectoral scope	N/A
AFOLU project category[3]	N/A

[2] *Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes*

[3] *See Appendix 1 of the* VCS Standard

Project activity type	N/A

1.4 Project Proponent

Organization name	AKÇAY HES ELEKTRIK URETIM A.S.
Contact person	Seçkin Demiryapan
Title	-
Address	Şehit Nevres Bulvarı, No:10, Kat:7 Deren Plaza Montrö / İZMİR TURKEY
Telephone	+90 232 463 98 11
Email	seckin.demiryapan@endaenerji.com.tr

1.5 Other Entities Involved in the Project

Organization name	GTE Karbon Sürdürülebilir Enerji Eğt. Dan. ve Tic. A.Ş.
Role in the project	Project consultant
Contact person	M. Kemal Demirkol
Title	Director
Address	Mustafa Kemal Mah. 2111. Sok. No: 5 06530 Cankaya - Ankara – TURKEY
Telephone	+90 312 514 63 63
Email	kemal.demirkol@gte.com.tr

1.6 Project Start Date

Project start date	14-August-2009
Justification	Commissioning Date

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable

	■ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	14-August-2019 to 13-August-2029

1.8 Project Location

The project is located in the Aegean Region of Turkey, within the province of Aydin. The project is on the Akcay creek. The altitude at the location is 65.00 m. Head pond coordinates are 615 038 E,4 182 935 N while plant building coordinates are 615 459 E, 4 183 125 N.[4]

[4] Akçay Final Feasibility Report, page 2/116

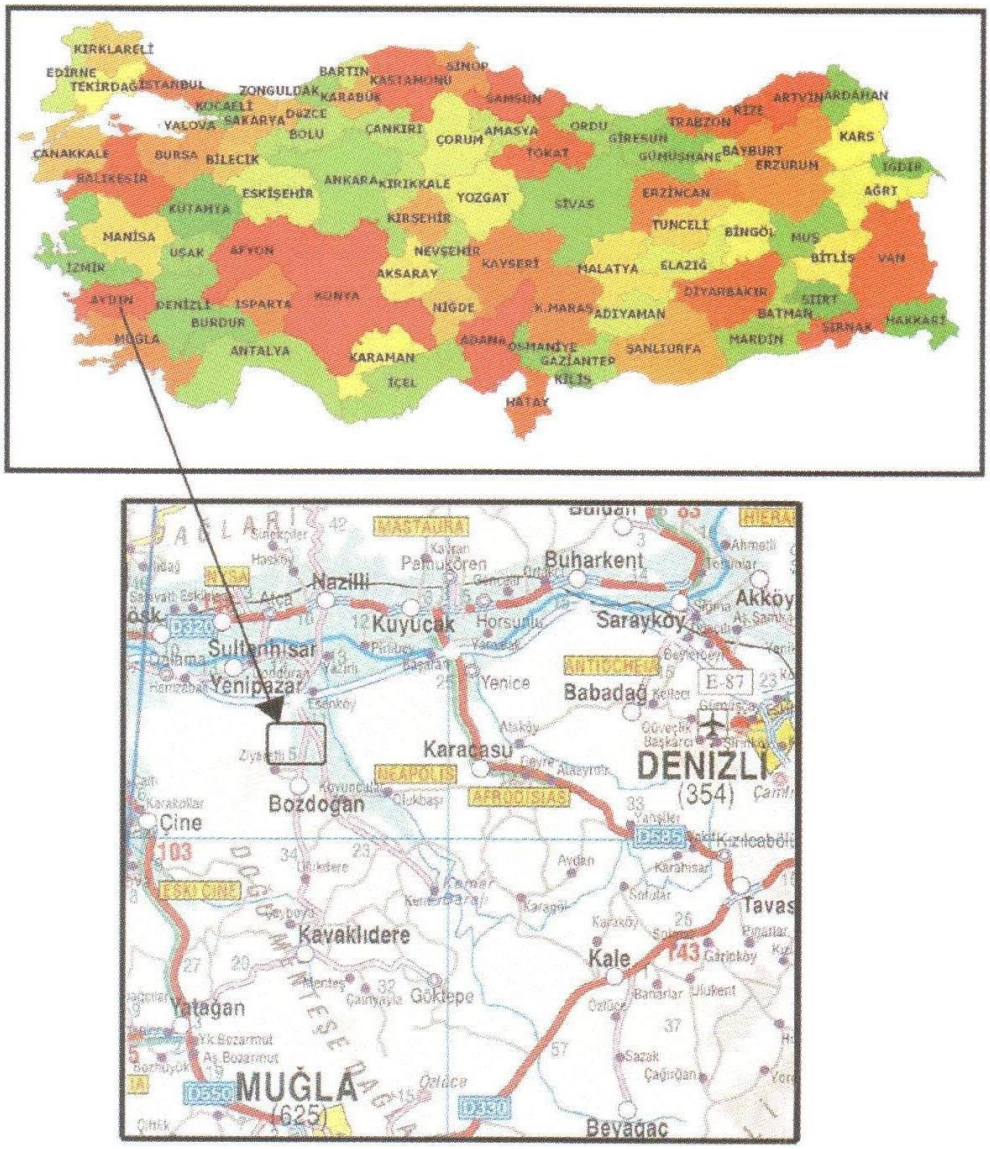

Figure 1. Location of the project on the map

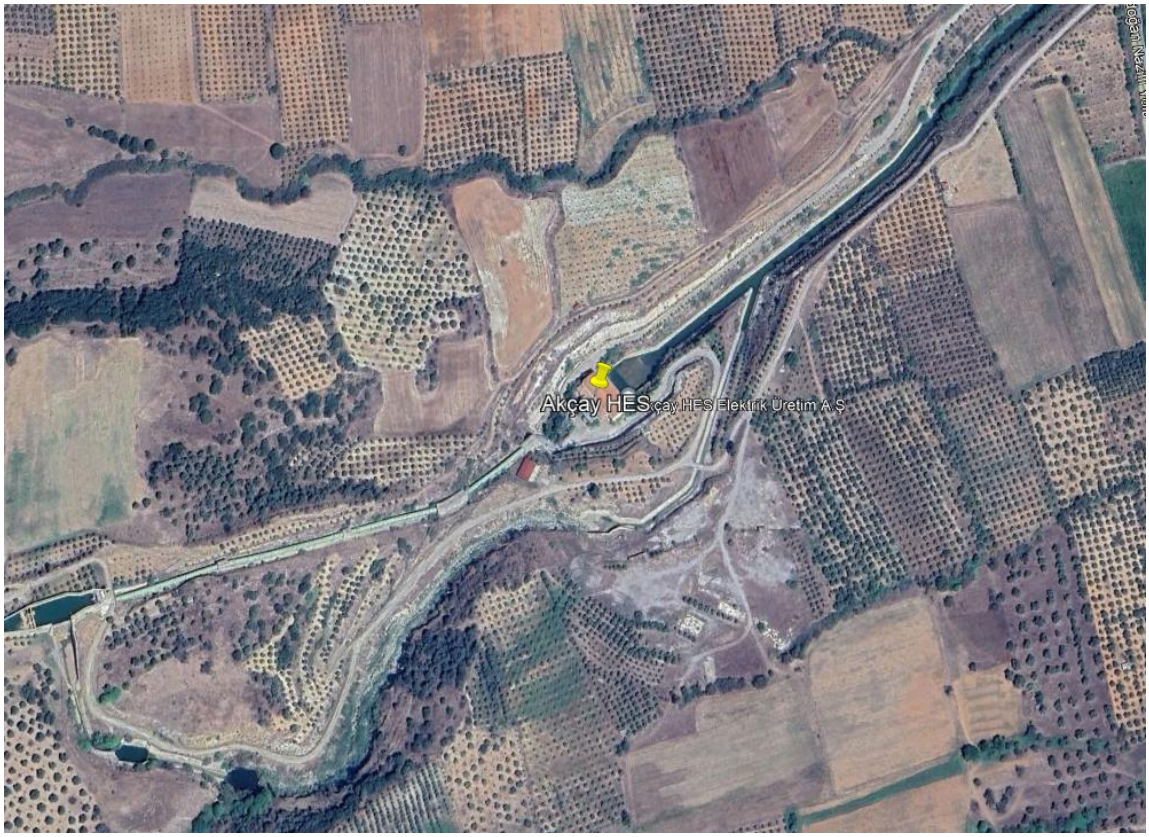

Figure 2. Location of the project activity

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0002	Grid-connected electricity generation from renewable sources	20.0[5]
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	07.0[6]

[5] https://cdm.unfccc.int/UserManagement/FileStorage/AG07ZJQ3EXD42LT5YV9HR16M8KINPO

[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

Tool	EB50 Annex 15	Tool to determine the remaining lifetime of equipment	01.0[7]

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

[7] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through the Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☒ No

1.12 Sustainable Development Contributions

The project aims to generate energy source by reducing the dependence on fossil fuels without producing air pollution or toxic by-products. Hydroelectric Power Plant supplies the increasing national electricity demand in a cleaner and sustainable manner.

The following is a list of the project's contribution to the UN SDG:

SDG-7 on access to affordable, reliable, and sustainable energy, as the project is not relying on imported fossil fuels. For this monitoring period, 139,355 MWh of clean electricity has been produced.

SDG-8 is to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for 11 people. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.

SDG-13 On urgent action to combat climate change, as the project is replacing the fossil fuel based national grid and it is producing emission reductions, 64,201 tCO_2 reduction for this monitoring period.

Table 1: Sustainable Development Contributions

Row Number	SDG Target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	13.3	Tonnes of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 64,201 tCO2 into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 949,301 tCO2 into the atmosphere Over Project Lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	Total 11 people were employed during this monitoring period.	Total 18 people were employed over project lifetime.
3)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project generated 139,355 MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 638,315 MWh electricity from hydropower which is a renewable source over project lifetime.

1.13 Commercially Sensitive Information

There is no excluded commercially sensitive information from the public version.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

Although the domestic laws and regulations do not require any stakeholders' participation, both in the project planning and construction phase, the project owner managed to conduct various unofficial and unstructured stakeholder participation meetings. The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person

from AKÇAY and relevant contact information was announced in the relevant meetings for ongoing communication.

The project owner used different channels to invite comments by stakeholders. Most of the meetings were held through the Mukhtar (village governors) and Council of Elderly (İhtiyar Heyeti; the village council) of Osmaniye village, and the officials of Municipality of Nazilli. The project owner visited various households in the project area to comprehend their needs and to identify how the project could assist in meeting the social and economic needs of the community. Due to the fact that the region is the least developed and most problematic region in terms of geographical conditions, during the construction period, the company helped the residents in the region to mitigate the effects of tough living conditions.

Below is the list of stakeholder comments and the details of those comments were taken into account.

- The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.

  Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, Aydın.

- The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project.

  The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs.

2.1.1 Stakeholder Identification

Stakeholder Identification	**Through consultation meetings, stakeholders are identified. Project manager is accessible by locals all the time. There is no problem encountered about the project/way of communication so far. If there is an input or grievance, locals can express them directly or via mukhtar.** Also, by the grievance book placed in the mukhtar office, locals can express their opinions about the project. In addition, the welfare of members of the public is checked during regular field visits during monitoring periods.

	There has not been any change related to the stakeholder make up after verification. The stakeholders identified in the validation are still valid.
Legal or customary tenure/access rights	Prior to project initiation, the project area hosted some agricultural production activity in some land. Such land has been expropriated with full consent from the villagers because the agricultural land under project affected area did not pose a commercial value to the farmers as those fields happened to be used for low value added crops such as cereals for household use and livestock feeding. The farmers were content with selling those fields for a good value and use the funds to improve their land they used for olive groves or for new machinery to for better olive oil processing. No expropriation was required during the monitoring period.
Stakeholder diversity and changes over time	The region is the least developed and most problematic region in terms of geographical conditions. Economic activity is weak and mostly driven by small-scale agriculture. There are mostly village population settlements in the surrounding area. The nearest town population is in Nazilli. No changes were reported regarding this issue during this monitoring period.
Expected changes in well-being	Based on the feedback from the stakeholder meeting held on 15/03/2021, it was observed that there was no negative impact on well-being. Additionally, no negative feedback was received regarding the project during this monitoring period.
Location of stakeholders	The project area is located on Akçay creek in Bozdoğan, Osmaniye District that is indicated in the Figure 3 below.

	 There is no prediction related to the impact to outside the project area.
Location of resources	The project is located in the Aegean Region of Turkey, within the province of Aydin. The project is on the Akcay creek. The altitude at the location is 65.00 m. Headpond coordinates are 615 038 E, 4 182 935 N while plant building coordinates are 615 459 E, 4 183 125 N.[8]

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	**The received feedbacks from the stakeholder consultation are reflected to the project implementation. Also, a contact person from AKÇAY and relevant contact information was announced for ongoing communication.** Also, by the grievance book placed in the mukhtar office, locals can express their opinions about the project. In addition, the welfare of members of the public is checked during regular field visits during monitoring periods. **Yet, there is no comments received affecting the design and implementation of the project.**
Date(s) of stakeholder consultation	15-03-2021

[8] Akçay Final Feasibility Report, page 2/116

Communication of monitored results	Monitored parameter results become publicly publishable after the monitoring reports are finalized.
Consultation records	The stakeholder consultation was realized as online because of COVID-19 measures, and during the meeting a meeting minutes was prepared.
Stakeholder input	•The stakeholders addressed unemployment and weak economic activity as the major social problems in the area. Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, Aydın. •The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project. The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs.

2.1.3 Free, Prior, and Informed Consent

Consent	**Although the domestic laws and regulations do not require any stakeholders' participation, both in the project planning and construction phase, the project owner managed to conduct various unofficial and unstructured stakeholder participation meetings. The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from AKÇAY and relevant contact information was announced in the relevant meetings for ongoing communication.**
Outcome of FPIC	The project proponent helped the public on social issues raised by Stakeholders and provided job opportunities

	and support in the construction of a mosque upon the public's request. The project proponent also purchased the public areas of the project at a good value before the project started as stated in the registered 2nd CP version 5 PDD[9].

2.1.4 Grievance Redress Procedure

During this monitoring period, there are no received grievances.

2.1.5 Public Comments

Summary of comments received	Actions taken
The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.	Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, *Aydın.*
The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project.	The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs.

2.2 Risks to Stakeholders and the Environment

Risk identified	Mitigation or preventative measure taken

[9] Referring to the registered 2nd Crediting Period Version 5 Project Design Document section 1.13.

Risks to stakeholder participation	No risk identified.	
Working conditions	• Occupational accidents due to the use of vehicles, machinery and equipment, • Fire risk	• Basic occupational health and safety training • Emergency drill Training • Training on working at height • Training on safe driving techniques The training records are shared with the DOE.
Safety of women and girls	No risk identified.	
Safety of minority and marginalized groups, including children	No risk identified.	
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	Risks identified with generation of waste oil, wastewater and solid wastes	Domestic solid wastes are kept at the site and collected by the municipality in regular periods. Domestic wastewater is, on the other hand, collected in a septic tank and disposed via sewage truck. Waste oil is disposed by the authorized disposal companies.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	**No incidents of sexual harassment or discrimination were reported during this monitoring period.**
Management experience	There is not any new entity involved in project design or implementation.

Gender equity in labor and work	Turkey has ratified ILO convention 100 and 111[10] and discrimination based on gender is illegal in Turkey. The project tries to align with the national gender strategy. So, the project does not involve and is not complicit in any form of discrimination based on gender difference.
Human trafficking, forced labor, and child labor	The project ensures compliance with Turkish labor laws to prevent the use of victims of human trafficking, forced labor, and child labor. This includes adherence to the Turkish Penal Code, which criminalizes human trafficking and forced labor, as well as the Turkish Labor Law, which sets strict regulations for the employment of minors. Through thorough recruitment practices, including background checks and age verification, and regular monitoring, the project upholds ethical labor standards, ensuring the protection and dignity of all workers involved.

2.3.2 Human Rights

Ensuring the ongoing recognition, respect, and promotion of the rights of Indigenous Peoples (IPs), local communities (LCs), and customary rights holders within a hydroelectric power plant project involves a multifaceted approach. This includes maintaining effective grievance mechanisms for voicing concerns, conducting regular consultations with IPs and LCs, and respecting their land and resource rights through equitable benefit sharing and fair compensation. Preservation of cultural heritage, robust environmental and social monitoring, capacity-building initiatives, and adherence to international standards such as the UN Declaration on the Rights of Indigenous Peoples and ILO Convention 169 are paramount. Transparency, accountability, and a commitment to meaningful engagement underscore the project's ongoing dedication to upholding human rights and customary practices, ensuring the holistic well-being of affected communities throughout the monitoring period.

2.3.3 Indigenous Peoples and Cultural Heritage

The hydroelectric power plant project prioritizes the preservation and protection of cultural heritage through various initiatives. It conducts thorough assessments of cultural sites and engages with Indigenous Peoples, local communities, and customary rights holders to incorporate their input and traditional knowledge into project planning. Physical measures, such as fencing and restricted access areas, are implemented to safeguard cultural resources, alongside ongoing monitoring and enforcement efforts. By integrating these measures, the project ensures the preservation of cultural heritage for future generations while respecting the cultural legacy of the communities involved.

[10] https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-ankara/documents/genericdocument/wcms_645630.pdf

2.3.4 Property Rights

Prior to project initiation, the project area hosted some agricultural production activity in some land. Such land has been expropriated withfull consent from the villagers because the agricultural land under project affected area did not pose a commercial value to the farmers as those fields happened to be used for low value added crops such as cereals for household use and livestock feeding. The farmers were content with selling those fields for a good value and use the funds to improve their land they used for olive groves or for new machinery to for better olive oil processing.

No expropriation was required during the monitoring period.

2.3.5 Benefit Sharing

As explained in Section 2.3.4, the project does not impact property rights.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified.	The project has no impacts on the biodiversity and ecosystems according to the prepared pre-assessment report for the EIA Regulation.
Soil degradation and soil erosion	No risk identified.	Erosion control is set by intensifying local characteristics. Soils resistance to erosion was improved. Soils permeability, water pressure formation and seepage is monitored. Site observations are done during visits.
Water consumption and stress	No risk identified.	The plant uses the water left from the channel to generate electricity, before conveying water to the Akcay river bed. Therefore, the project activity does not include any reservoir area ordiversion weir. The project not only produces electricity from water, but also plays a role of

		conveying water to the river bed as a part of the irrigation channel.
Usage of fertilizers	No risk identified.	Any fertilizers are used in the project.

2.4.1 Rare, Threatened, and Endangered species

The project is not located in, or adjacent to habitats for rare, threatened, or endangered species.

2.4.2 Introduction of species

For this project, planting and species introduction is not required.

There is no invasive species in the project area.

2.4.3 Ecosystem conversion

N/A

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The plant uses the water left from the channel to generate electricity, before conveying water to the Akcay river bed. Therefore, the project activity of AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), Turkey does not include any reservoir area or diversion weir. The project not only produces electricity from water, but also plays a role of conveying water to the riverbed as a part of the irrigation channel. There is no dam within the context of project activity. Implementation of the project consists of construction of the following main items: Penstock with length of 380.00 m.; Powerhouse with Francis type turbines. In the powerhouse, three vertical shaft Francis turbines is installed, two 11.60 and one 5.58 MW (total capacity is 31.98 MWm/28.78 MW). It generates electricity by using the potential energy of the water reaching the loading dock from the irrigation channel with 3 vertical Franchis hydraulic turbines. The 12 Monitoring Report: VCS Version 4.0 first-hand turbines which are used in the project are supplied from Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China. The project has been in operation since 14/08/2009. Crediting period for the project will be 10 years. First crediting period is 14/08/2009-13/08/2019. AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), Turkey takes the water for production from Kemer Dam, which is under the control

of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), Turkey is located at the end of this channel. Therefore, AKCAY 28.78 MW, HYDROELECTRIC POWER PLANT PROJECT (HEPP), Turkey can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure for those years. Apart from this, there is nothing that affected the operation of the plant.

3.2 Deviations

3.2.1 Methodology Deviations

There was no deviation related applied methodology during this monitoring period.

3.2.2 Project Description Deviations

There was no deviation in the project description during this monitoring period.

3.3 Grouped Projects

This project is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CMy}$
Data unit	tCO_2/MWh
Description	Baseline emission factor: the combined emission factor of theproject grid system
Source of data	Turkey Ministry of Energy and Natural Resources https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea- bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-

	_Web_Sitesi.pdf
Value applied	0.4607
Justification of choice of data or description of measurement methods and procedures applied	”Tool to calculate the emission factor for an electricity system”
Purpose of Data	Baseline emission calculation
Comments	EFgrid,CMy value (0.4607 tCO2/MWh) is valid for the duration ofthe crediting period.

Data / Parameter	**CapBL**
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity
Source of data	Project Proponent
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	”ACM0002-Equation 7”
Purpose of Data	Project emission calculation
Comments	The plant is new.

Data / Parameter	**A_{BL}**
Data unit	m2

Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full
Source of data	Topographical surveys or maps
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	”ACM0002-Equation 7”
Purpose of Data	Project emission calculations
Comments	The plant is new.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility, y}$
Data unit	MWh/y
Description	Quantity of electricity generated and supplied by the project power plant to the consumers/electricity consuming facility i in year y
Source of data	EPIAS records and Meter reading records-OSF forms
Description of measurement methods and procedures to be applied	EPIAS records and meter reading records provides the exact electricity generation of the facility and the imports from the grid. According to meter reading protocols, the internal consumption of the facility was subtracted from the gross generation. EPIAS data are used for the quantity of net electricity delivered to the grid, and it has been cross checkedwith the meter reading records (OSF forms) provided to the company by TEIAS.
Frequency of monitoring/recording	Continuous measurement / Monthly recording

Value applied	139,355 MWh
Monitoring equipment	Electricity meters
QA/QC procedures to be applied	Cross check measurements results with records for sold electricity. Calibration of the meters are valid for 10 years based on related regulation. In addition to the meters which is used for billing purposes, records taken by meters using at project site is used for comparison. The meters should also comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit. Maintenance and calibration of the metering devices are made by TEIAS. If there is a noticeable difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment is done before waiting for the periodical maintenance. In cases where electricity meters are regulated (e.g. the electricity is supplied to the electric grid), the electricity meter is subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.
Purpose of data	To calculate the quantity of net electricity delivered to the grid

Calculation method	EGFacility,y=EGexport,y-EGimport,y (Annual electricity generation of the plant is calculated as the sum of the monthly generations obtained from EPIAS records. After deducting the amount of imported electricity from the generated electricity, the net electricity supplied to the grid is evaluated.)
Comments	-

Data / Parameter	CapPJ
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Supplier information on the equipment
Frequency of monitoring/recording	Once at each monitoring period
Value applied	28,780,000 W
Monitoring equipment	N/A, since no monitoring equipment is needed to determine the installed capacity.
QA/QC procedures to be applied	Supplier information on the related equipment and the existence of the equipment will be checked. Also this information can be checked from EPDK.
Purpose of data	To check the project's installed capacity
Calculation method	N/A, no calculation method was used since installed capacity is a given supplier information.
Comments	No change on the installed capacity with respect to the generation license.

Data / Parameter	A_{PJ}
Data unit	m2
Description	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Registered Project Description
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Once at each monitoring period
Value applied	0
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Project emission calculation
Calculation method	N/A
Comments	In the Registered Project Description, the area value is taken as 0.

4.3 Monitoring Plan

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the project within the crediting period is complete, consistent, clear and accurate. There are three sets of data to be monitored during the project activity.

The first one is the amount of electricity fed into the grid. There is already an electricity meter installation and these records provided the data for the monthly invoicing to TEIAS which form the basis for EPIAS data. EPIAS data is developed remotely by TEIAS and shows the monthly electricity generation of the company.

The second data to be monitored is the installed capacity of the project activity. The data is monitored from the digital displays on the equipment which show the installed capacity at the time, together with the electricity generation of the facility. The installed capacity can be monitored from turbine labels and also the generation license.

The third data to be monitored is the reservoir area for HEPP projects in general. However, because the subject project use the water left from the irrigation channel and it has no reservoir area, this data is not applicable for the project.

The project is operated by Akçay HES Elektrik Üretim A.Ş. which ensures the overall site management in accordance with Turkish Laws and technology providers' guidelines.

VER Team Members are expected to include the following staff of the HEPP:

Plant Engineer: Responsible for the control of the electricity supplied to the grid and imported from the grid with TEIAS. The electricity measurements are made by TEIAS remotely. The plant engineer checks these electricity measurement records and reports to the Operations Manager of the plant.

Accounting Manager: Responsible for keeping data about power sales, invoicing and purchasing.

Operations Manager: the VER coordinator, responsible for developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures.

GTE: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

In order to demonstrate the emission reduction, only required data is the net electricity delivered to the grid by the project activity. TEIAS has started to extract generation data from the facilities remotely through the EPIAS (previously PMUM system) which forms the basis for the billing.

During the monitoring period EPIAS readings and meter reading records (OSF forms) were used as the source of calculation of electricity generation and emission reductions. Meter reading protocols were compared for cross-check. Generation data collected during crediting period was submitted to GTE who is responsible for calculating the emission reduction subject to verification. Generation data were used to prepare monitoring report which was used to determine the vintage from the project activity.

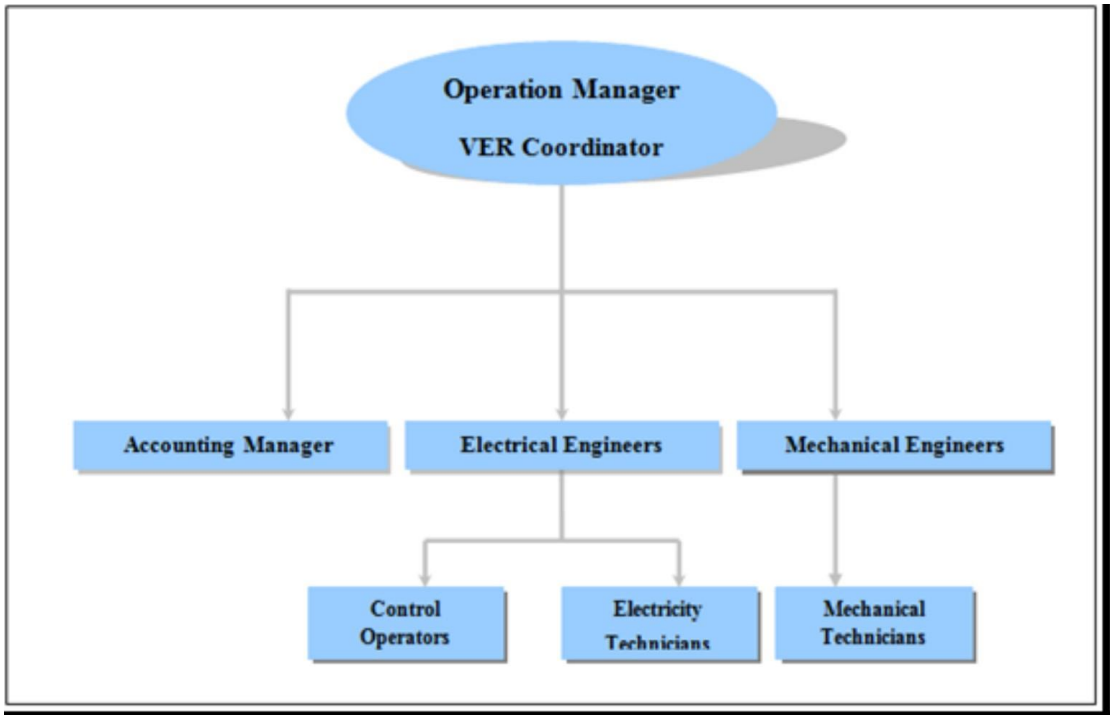

Figure 6. Site organizational chart

The monitoring report covers the monitoring of grid-connected power generation, check report; report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc. All data collected as part of monitoring is archived electronically and kept at least for 2 years after the end of the last crediting period. The company establishes a dedicated maintenance system to ensure the data availability for the required period.

In line with the EMRA requirements, the company purchased and installed one unit electricity meter, but since the February 2013, company installed an addition unit meter and all measurements are realized by the two unit meters for the Akçay Hydroelectric Power Plant. The serial numbers of main meters are 376480 and 471186. The accuracy class of the product production is 0.5s. The serial number of first main meter's back-up is 376486 and the serial number of second main meter's back- up is 471187. According to the test reports of meters, the meters were tested by TEIAS on 11/05/2014, at first. Then, on 23/10/2018, due to the expiration of the seal period, Main Meter-1 and Main Meter-2 were replaced with ITRON brand meters with serial numbers 84051483 and 84051484, and Spare Meter-1 was replaced with the dismantled Main Meter-2 with serial number 471186. Also, in the same day, the meter tests have been realized.

On 20/05/2020, the meters have been changed again due to the commissioning of Bozdoğan Transformation Center. The changed meters have been tested in 03/11/2022. Detailed info about the meters are given in the table below.

Table 3. Meters Properties

First Meters	Feeder 1		Feeder 2	
	Main	Spare	Main	Spare
Brand	ELSTER	ELSTER	ELSTER	ELSTER
Type	A1500	A1500	A1500	A1500
Class	0.5S	0.5S	0.5S	0.5S
Serial No	376480	376486	471186	471187
Date of Initial Calibration	2009	2009	14/02/2013	14/02/2013
Date of Installation	2009	2009	14/02/2013	14/02/2013
Date of TEIAS Test	20/11/2017	20/11/2017	20/11/2017	23/10/2018
Replacement Date	23/10/2018	23/10/2018	23/10/2018	20/05/2020

Second Meters	Feeder 1		Feeder 2	
	Main	Spare	Main	Spare
Brand	ITRON	ELSTER	ITRON	ELSTER
Type	SL761X071	A1500	SL761X071	A1500
Class	C-2S	0.5-2S	C-2S	0.5S
Serial No	84051483	471186	84051484	471187
Date of Initial Calibration	23/10/2018	23/10/2018	23/10/2018	14/02/2013
Date of Installation	23/10/2018	23/10/2018	23/10/2018	14/02/2013
Date of TEIAS Test	23/10/2018	23/10/2018	23/10/2018	23/10/2018
Replacement Date	20/05/2020	20/05/2020	20/05/2020	20/05/2020

Third Meters	Feeder 1		Feeder 2	
	Main	Spare	Main	Spare
Brand	EMH	ITRON	EMH	ITRON
Type	LZQJ-XC	SL761X071	LZQJ-XC	SL761X071
Class	C- 2S	0.5 – 2S	C – 2S	0.5 – 2S

Serial No	9276783	84051667	9276784	84051668
Date of Initial Calibration	20/05/2020	20/05/2020	20/05/2020	20/05/2020
Date of Installation	20/05/2020	20/05/2020	20/05/2020	20/05/2020
Date of TEIAS Test	03/11/2022	03/11/2022	03/11/2022	03/11/2022

Calibration of the metering devices has been made by TEIAS and sealed before the commissioning of the power plant. The meters were calibrated by TEIAS. The installed meters are in line with the regulations.

For internal auditing, TEIAS is in charge. Project owner is not responsible for any audit related to electricity meters, etc. In case of any problem with them, teams from TEIAS handle the issue.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emission is calculated according to the formula: BEy = EGy x EFy

Where:

EGy = Net electricity delivered to the grid by the project activity in year y excluding transmission losses of the grid

EFy = Emission factor calculated according to selected methodology According to the Ministry of Energy and Natural Resources document named as Turkey's National Electricity Network Emission Factor Factsheet, OM is calculated as 0.6993 tCO2/MWh whereas BM is 0.3812 tCO2/MWh)11 Therefore, CM is calculated as 0.4607 whereas 0.25 and 0.75 weightage factor given to OM and BM, respectively.

BE_{2019} = 17,245 MWh × 0.4607 tCO2e/MWh = 7,945 tCO2e

BE_{2020} = 35,694 MWh × 0.4607 tCO2e/MWh = 16,444 tCO2e

BE_{2021} = 18,593 MWh × 0.4607 tCO2e/MWh = 8,566 tCO2e

BE_{2022} = 48,276 MWh × 0.4607 tCO2e/MWh = 22,241 tCO2e

BE_{2023} = 19,547 MWh × 0.4607 tCO2e/MWh = 9,005 tCO2e

5.2 Project Emissions

As per AMS-I.D. : Grid connected renewable electricity generation, v18.0, page 7, “For most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

- Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption)
- Emissions from water reservoirs of hydro power plants”

Therefore, as per ACM0002 : Grid-connected electricity generation from renewable sources, v20.0

The project activity involves the generation of electricity by hydroelectric power plant therefore project activity does not result in greenhouse gas emissions.

PEy = PE FF,y + PEGP,y + PEHP,y

Where:

PEy = Project emissions in year y (t CO2e/yr)

PE FF,y = Project emissions from fossil fuel consumption in year y (t CO2/yr)

PEGP,y = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO2e/yr)

PEHP,y = Project emissions from water reservoirs of hydro power plants in year y (t CO2e/yr) Since this project uses hydroelectric power PEGP,y is “0” (t CO2/yr)

The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. According to the applied methodology ACM0002_(v20.0) ” for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected (paragraph 38). Therefore;

PE FF,y = 0 (t CO2/yr)

Beside of the diesel generator, other potential project emission for this project is PEHP,y PEHP,y = Project emissions from water reservoirs (t CO2e/yr)

PEHP,y = EFRES * TEGy /1000

Where;

EF_{HES} = Default emission factor for emissions from reservoirs of hydro power plants (kg CO2e/MWh)

TEGy = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

However, if the power density of the project activity is greater than 10 W/m2 than PEHP,y =0 The power density (PD) of the project activity is calculated as follows:

PD = (CapPJ – CapBJ) / (APJ - ABL)

Where:

PD = Power density of the project activity (W/m2)

CapPJ = Installed capacity of the hydro power plant after the implementation of the project activity (W)

CapBJ = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

APJ = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m2)

ABL = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero

PD = (28,780,000 W – 0) / (0 -0) =∞

Therefore, power density is assumed to be 0 as suggested by the methodology. PEy = PE FF,y + PEGP,y + PEHP,y

PEy = 0 + 0 + 0 = 0 (t CO2/yr)

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5.3 Leakage Emissions

The energy generating equipment is not transferred from or to another activity. Therefore, leakage is also considered as “0”.

LEy = 0

As a result, Total Emission Reduction is: ERy = BEy

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Reduction VCUs (tCO_2e)	Removal VCUs (tCO_2e)	Total VCUs (tCO_2e)
14-08-2019 to 31-Dec-2019	*7,945*	*0,000*	*0,000*	*7,945*	*0,000*	*7,945*
01-Jan-2020 to 31-Dec-2020	16,444	0,000	0,000	16,444	*0,000*	16,444
01-Jan-2021 to 31-Dec-2021	8,566	0,000	0,000	8,566	*0,000*	8,566
01-Jan-2022 to 31-Dec-2022	22,241	0,000	0,000	22,241	*0,000*	22,241
01-Jan-2023 to 31-Dec-2023	9,005	0,000	0,000	9,005	*0,000*	9,005
Total	64,201	0,000	0,000	64,201	*0,000*	64,201

Vintage period	Ex-ante estimated reductions/ removals	Achieved reductions/ removals	Percent difference	Explanation for the difference
14-08-2019 to 31-Dec-2019	13.459	7,945	-41.0	The project takes the water for production from Kemer Dam, which is under the control of DSİ.

				Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. The plant is located at the end of this channel. Therefore, the project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure.
01-Jan-2020 to 31-Dec-2020	35.091	16,444	-53.1	The project takes the water for production from Kemer Dam, which is under the control of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. The plant is located at the end of this channel. Therefore, the project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring

				period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure.
01-Jan-2021 to 31-Dec-2021	35.091	8,566	-75.6	The project takes the water for production from Kemer Dam, which is under the control of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. The plant is located at the end of this channel. Therefore, the project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure.
01-Jan-2022 to 31-Dec-2022	35.091	22,241	-36.6	The project takes the water for production from Kemer Dam, which is under the control of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. The plant is located at the end of this channel. Therefore, the

				project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure.
01-Jan-2023 to 31-Dec-2023	35.091	9,005	-74.3	The project takes the water for production from Kemer Dam, which is under the control of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. As per indicated in the research on dam occupancy rates on a provincial basis, decreases in the dam occupancy rate also support the fact that electricity production is lower than expected.[11] The plant is located at the end of this channel. Therefore, the project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam

[11] https://cdniys.tarimorman.gov.tr/api/File/GetGaleriFile/425/DosyaGaleri/5752/4.8.il_bazinda_baraj_doluluk_oranlari_20102022.xls

				under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure.
Total	153,823	64,201	-58.3	The project takes the water for production from Kemer Dam, which is under the control of DSİ. Since the primary purpose of the Kemer Dam is irrigation, no water is discharged except the irrigation season in drought periods. The plant is located at the end of this channel. Therefore, the project can operate only during the irrigation season (April to October) in drought periods. But in rainy periods, water is discharged from the dam under the control of DSI also except the irrigation season. Additionally, throughout the monitoring period Turkey experienced dry years due to climate change. For these reasons, the realized figure is a bit lower than the estimated figure. According to the rainfall records kept by the General Directorate of Meteorology, it is seen that the rainfall in the Büyük Menderes Basin, where the facility is located, will be 20%-40% less than

				normal in 2023.[12] In addition, in the study titled "Trend Analysis in Büyük Menderes Basin Precipitation" conducted in 2015, states that the amount of precipitation in the Kemer Dam, which is the water source of the facility, tends to decrease.[13]

[12] https://www.mgm.gov.tr/veridegerlendirme/havzalara-gore-yagis.aspx?y=k

[13] https://www.imo.org.tr/Eklenti/6710,176755029pdf.pdf?0&_tag1=A4AFA5713A22085A62F3FBAB0F886A70CD57FAC1